AMALGAMATED CLOUD AI: TRANSPIRING REVOLUTION IN BROADBAND CELLULAR NETWORK STANDARDS

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Abstract: *Advancements in computation have driven mankind to new destinations. This sophistication has given a new space of combination of Multiple Technologies and their interconnections. The amalgamation of such interoperability has opened for a wide range of customized services to the end-users. Fifth Generation Mobile Networks Standard has just launched in a few countries like China and the researches for the Sixth Generation standard are on the way to explore. People are now much aware of the cloud and its data centers, Artificial Intelligence, and Machine learning techniques. Now 6G is a Coming up Technology. It is the latest upcoming cellular brand bond technology standard. This is going to replace 5G incoming of the years. This paper would provide some of the glimpses of such 6G.*

Keywords*: 5G,6G, Cloud computing, Artificial Intelligence, Machine learning, Broadband, Cellular network, Mobile phones, Signals, Download speed, Upload speed.*

I. INTRODUCTION

The exchange of information from one person [1] to another is called communication. It is done in many ways. The first form of communication is verbal. It means one speaks and the other one listens and vice versa. However, if these conversants are located at two different geographical locations and conversation is needed, it is done using some telecommunication approach. Telecommunication is done using some electronic tools [2] which would easily express the required information or message in a short time. The electronic tools transmit the message to a longer distance within a short period. The word 'Tele' means 'distance' and 'phone' means 'communication'. Therefore telephone means distant communication. It means communicating with a person who is in a long-distance.

The Scientist Alexander Graham Bell is the reason behind all these scientific investigations today. He invented this device in 1876 in the USA. Today many people might have not seen but till the early 1990s Rotary Dial Telephones has dominated almost all areas in public places, Government offices, and private individual houses. Later Push-button phones have dominated the market. These are a few examples of Landline phones [3]. Later Mobile phones came into existence. Mobile Phones are movable phones; they do not have any wires connected to any telephonic links. They run on a Wireless network process. These mobile phones will have a Sim Card which will provide a Unique Identity to the subscriber. From anywhere on this globe no other person would have this number. These Sim cards are removable and insertable into the mobile.

All today's Mobile phones would have CPUs. But these CPUs will run on lesser electrical or battery power with less

memory and more sophisticated work. Today's modern phones will have many features like radio, music, navigational tools, and some more video games, etc.

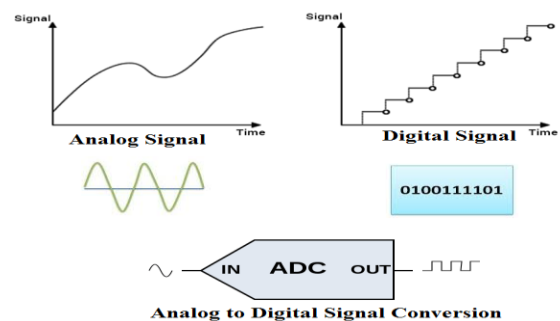Fig. 1. Pictorial representation of TelePhones [3]

Fig. 2. Analog Signal , Digital Signal and Analog to Digital Signal Coversion [4].

In the 1st Generation Mobiles, the network signals used are analog by nature. The 2nd Generation Mobiles are digital networks. These networks use approximately 12-15kbps. In this generation, people have enjoyed text messaging. 3rd Generation has increased new frequency bands thereby data transfer rates have increased 4th Generation has given away to the internet accessibility, HD TV, Games[4], Cloud-based services. 5th Generation is under development. It is aimed to reduce the latency and increase the efficiency of coverage. Speed-wise the 1st Generation has experienced 2 kbps. The speed 200Kbps in 3G and in 5G is aimed at being as fast as 35.46 Gbps.

II. NEED OF CLOUD TECHNOLOGY IN MOBILE NETWORK SERVICES

In the earlier days, people used to have lesser transactions on mobiles. They were realistic and their works have existed in the real world. But today's world is turned much more Virtual rather than realistic. Perhaps much of the shopping is done on mobiles today [5]. The characteristics of the goods are provided with all minute details and photos on the commercial sites they are being purchased with digital currency. Therefore it needs a lot of data to be generated and used and vice versa.

Hence there is a need for cloud computing. These cloud services could store a large amount of data related to the customers and the sellers online.

Processing these data and the applications would increase the speed enormously. The data is acquired from much more remote locations using a simple internet connection suing with some simple secured protocols. The cloud space is enough to maintain many volumes of information for many years. A cloud is formed from the collaboration of many data centers together to provide a reliable service to the customers. This enormous amount of data storing on the servers are not possible, thereby 3rd party assistance is used in the form of cloud as a support to the existing services to the customers.

When a user enters some details for his commercial or financial services in his/her mobile needs to connect to a web application, thereby which it should connect to a server which is at a remote location. All the services of the server need to be achieved using some web browser that works like a mediator [6]. Generally, Web application service is provided with a blend of added service-oriented architecture. Thereby it can be known as a sophisticated internet-based application.

III. ARTIFICIAL INTELLIGENCE USAGE IN MOBILE NETWORKS

AI is an acronym for Artificial Intelligence. It is an antonym for natural intelligence. Natural intelligence is an exhibiting nature of natural living beings and Artificial Intelligence is done by the devices [7]. These devices are generally called agents. Devices are aimed to achieve their targets more precisely than natural beings. These agents can have the capacity to store in memory, they can learn, they can make a decision and express appropriately. All these activities simply follow human intelligence thereby possible

to deploy in many other fields where human involvement is not possible. The power of AI is known to the world when NASA's Delta II in 1997 has achieved its targets during many scientific investigations that are carried out on the mars surface. These investigations included climatic conditions on Mars, rocks on Mars, and the existing soil on mars planet. The quality of services has increased and that is being reflected in several applications as we have seen today we are using many sophisticated AI applications like Alexa-Smart Assistance [8]. This is a virtual one. Spam Filters in Mails. Recommended notices for the viewers for the Television shows like Netflix, Manufacturing robots, etc.

AI can be used in Mobile Network Services (MNS) such as to provide more reliable and customized services [9] to the users. Some of them can be,

i). Network operations monitoring
ii). Network operations management
iii). Fraud-detection and reduction in Mobile transactions
iv). Security to the Cyber devices
v). Customer services
vi). Marketing management
vii). Digital Assistance
viii). Customer Relationship Management

IV. THE SIXTH GENERATION MOBILE NETWORK

Fifth Generation Network Standard would provide new functionalities along with this it would also provide improved service quality in contrast with Fourth Generation Network Standard. Fifth Generation Network Standard would encompass numerous new additional strategies, together with the latest frequency bands for instance the mmWave and the optical spectra, superior spectrum utilization and control, and the combination [10] of licensed and unlicensed bands. Nevertheless, the fastest boom of the data center based centric and automated systems can also exceed the competencies of 5G Wi-Fi structures.

A few devices, together with virtual reality (VR) devices would go to head past 5G due to the fact they would require not less than 10 Gbps facts charge. The key drivers of sixth-generation might be the convergence [11] of all of the past capabilities, which includes community densification, excessive throughput, and reliability at a high level, lesser energy consumption, and higher data for the connectivity. The sixth-generation machine could additionally maintain the traits of the previous generations, which included new offerings with the addition of new technology.

The new offerings consist of Artificial intelligence, Smartest Wearables, Smarter Implants, Automated Cars, and 3-D mapping. The most vital needs for Sixth Generation Standards is the capability of managing large volumes of records and very excessive-statistics-fee connectivity in step with gadgets. The sixth-generation mobile network is under development. This generation has many exciting features.

As per reliable sources like Cisco, these features include driving and maintenance of different types of vehicles, assigning different tasks and achieving the targets more precisely by robots, running and maintaining different drones in commercial and non-commercial areas [12], maintenance

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and safeguarding of home appliances and supporting them in IOT, supporting many smart devices in the fields of constructions, maintenance, and industries.

The feature also includes upcoming technologies like augmented reality, extended reality, and virtual reality, etc. Speed of internet access would increase in geometrical proportion. The influence of this technology would bring out some exciting offers to society such as,

1. Zero road accidents,
2. Advanced level precise health care,
3. Zero crime rates in society.

V. SIXTH GENERATION AND ITS CHALLENGES

By the time 2030, all of the people would be using 6G. The upcoming 6G needs much more sophisticated services by using 1TB per second. This means one would have the devices which would receive its signals 8000 GB per second. This prediction is based on a study at Sydney University. It would have decentralized networks. Not based on one single operator perhaps a collection of operators would cohesively provide the [13] services to the user. Science fiction like communicating with some others in the space could be easily possible with this 6G. China has already started the 6G Development project. Very recently China has launched 5G.

There is going to be a tough challenge for the implementation in 6G. This new wireless communication will require ultra-reliable low latency communication networks. Not only this, the upcoming devices should possess the speed [14] of terabit/second speeds. This requires making much more advancement in the field of electronics.

VI. MAJOR DEMANDING ADVANCEMENTS

Some more aspects need to be advanced.

1. Computational Power: has to be increased. The present computational power is not sufficient even for 5G. Accommodating present-day computational power [15] for 6G would be un-imaginable.
2. The Reliability: has to be increased. Mission-critical tasks in 6G needs a high level of reliability and consistency.
3. The Network Coverage: need to be widespread. Antennae numbers and density has to rise more.
4. The Network speed: needs to be much faster. It requires THz of speed.
5. Energy capability: needs to be increased. Present-day batteries are not enough competent for 6G.
6. Security: has to be increased. There it should not leave a chance for Hackers and Crackers.
7. The Spectrum share: must be focused. There it should no race but co-operation between the operators.
8. Governing consortium: Till now there is no formal entity is existing which would govern the technology in the coming days. It is needed to be established.

VII. SERVICE REQUIREMENTS FOR 6G

The 6G wireless system will have the following key factors:

1. Mobile Brand band need to be Enhanced,
2. Lesser Latency Communications that are Ultra-Reliable,
3. Machine Type Machine Communication,
4. Communication Integrated with Artificial Intelligence,
5. Perceptible Internet,
6. Throughput at a higher level,
7. More Network Capability,
8. More Energy Capability,
9. Lesser backhaul,
10. Lesser Network Access overcrowding,
11. Improved Security for Data.

VIII. KEY PERFORMANCE INDICATORS IN 6G

These below are key performance Indicators in upcoming 6G. They are such as,

(i).System Capacity
a. Peak Date Rate in Gbps-1000
b. Experienced Data Rate -1 Gbps
c. Peak Spectral Efficiency-60 b/s/Hz
d. Experienced Spectral Efficiency -3b/s/Hz
e. Maximum Channel Bandwidth -100GHz
f. Area Traffic Capacity 1000Mbps/m2
g. Connection Density 107 devices/km2
(ii).System Latency
a. End-to-End Latency 0.1 ms
b. Delay Jitter 10-3
(iii).System Management
a. Energy Efficiency 1 TB/J
b. Reliability 10-9 Packet Error Rate
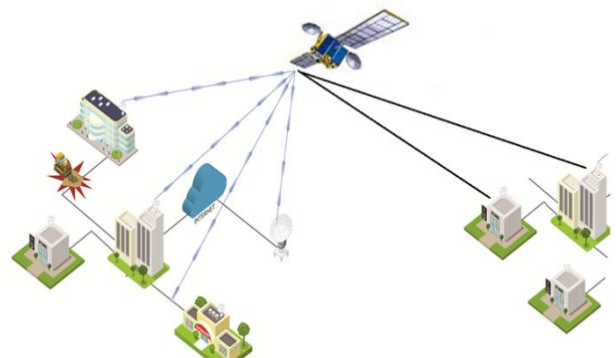c. Mobility 1000 km/h

Fig. 3. Pictorial representation of Sample 6G Network usage [15]

IX. KEY FACTOR REQUIREMENTS IN SIXTH GENERATION

Important requirements of Sixth GenerationMobile communication standards could be as given below.

1) High-Performance Networking: Compared with Fifth Generation communications, Sixth Generation communications would help in terms of networking and connecting most of the people. Presently in highly populated areas, this task may not be such an easy task. Even in the case of less populated areas deep below the water surface also the communication signals are not possible to connect.

Sixth Generation communications will use novel conversation networks to support completely different types of data such as audio, video, etc which would reach a new type of experience in the communication using the virtual networking technology along with the involvement everywhere.

2) Higher Energy Efficiency: In Sixth Generation Mobile network standards, there would exist higher energy capability necessities for Wi-Fi gadgets with charging limits.

Apart from this battery for the mobile has become being lost for a lesser time. Hence, lengthy battery existence and usage would be the most considerable points for the point of research in this standard communications.

Considering a case such Unmanned Aerial Vehicle (UAV), Electric Vehicles (EVs), through Wi-Fi energy switch era. Recently, to address power problems for wireless devices, and upcoming technology is named Symbiotic Radio (SR) that is delivered to integrate passive backscatter gadgets with a lively transmission device. A traditional instance of SR is ambient backscatter communication that would allow the network gadgets to make use of ambient RF indicators to transmit information without requiring energetic RF transmission, making battery-free communique possible. Smart electricity control is every other promising mechanism to dynamically optimize the stability among electricity needs for the supply.

For the green communication technologies, the AI-based solutions would be quite important for the optimization of power utilization and power usage scheduling for all the Wi-Fi devices in an ever-changing technological environment along with the more complicated optimization goals. Available and existing updated machine learning-based technologies for instance Deep Reinforcement Learning (DRL), could be used for the optimization. This would optimize the computing task devolvement in deciding the Wi-Fi gadgets along with improved scheduling solution of working and suspended time, which would reduce the energy utilization.

Apart from this, it phenomenon would improve energy capability also. The artificial intelligence-based solutions would also be applied in a Multiple Hop Data Routing (MHDR) in a co-operative relay communication along with the available communication infrastructure installation in the network densification of sixth-generation scenarios. This would surely decrease the transmit electricity of the wireless gadgets without having a long propagation distance, thereby enables high capability communication.

3) A High-Level Security along with the Privacy: The available researches particularly specialized in network throughput, reliability, and delay in 4G and 5G communications.

But, within the beyond few years, wireless communicational exchange security and privacy-related issues have been neglected to some extent. Since information security and privacy-related troubles are closely related to user's data, defensive statistics security and privateness has to turn out to be a very essential part of human-centric sixth-generation communications.

Meanwhile, conversation/records provider vendors legally accumulate a massive amount of user information, which would end up in frequent leakage of privacy of information. To resolve this hassle, it's miles envisaged that FL strategies [18] can be used to acquire privateness-stronger deep gaining knowledge of in sixth-generation networks.

4) A High-Level Intelligence: The high-level intelligence of the sixth generation would be beneficial to provide users with high-quality, personalized, and intelligent natured services [19]. The High-intelligent sixth-generation standard would include (i) operational intelligence,(ii) application intelligence, and (iii) service intelligence such as given below,

(i).Operational Intelligence: Traditional network operations involve a series of resource optimization and multi-goal overall performance optimization issues. To gain a good level of network operation, optimization strategies primarily based on game theory, contract concept, and many others are broadly used. However, those optimization theories won't obtain the top-rated answer in large-scale time-varying variables and multi-objective eventualities.

With the development of deep learning technology, the above can be solved with the help of superior [20] machine learning technologies. Apart from this, the emerging of federated learning has converted the multi-goal linear optimization problems into a nonlinear optimization problem, as a result locating out the pleasant solution for complex and times various decisions in operational intelligence.

(ii). Application Intelligence: At present, applications associated with Fifth Generation networks are progressively turning into intelligent. For sixth-generation networks, intelligent applications are one baseline of applicational needs. FL empowered Wi-Fi communication technology to permit gadgets to connect to sixth-generation networks to run a variety of intelligent applications [21].

(iii). Service Intelligence: Furthermore, as a human-centric network, the excessive intelligence of the sixth generation community will offer intelligent services in a satisfaction oriented and personalized way. For instance, FL would give customers personalized healthcare offerings [22], customized recommendation offerings [23].

5) Green Communication standard: It is more and more enormous for the inexperienced communication to make excellent decisions for optimizing the resource usage and conversation to be more effective. In the sixth generation communicational situations, because of the huge network site usage traffic, gadgets, and dynamic community environments, there exist more and more complicated resource optimization issues [24] for instance inexperienced communication optimization and offloading the choice, that conventional mathematical programming techniques and optimization answers cannot be addressed.

X. CONCLUSIONS AND FUTURE WORK

Advancements in computation have given a new space of combination of Multiple Technologies and their interconnections. The amalgamation of such interoperability has opened for a wide range of customized services to the

end-users. Fifth Generation Mobile Networks Standard will no longer have the ability to supply a very automated and intelligent network that would offer everything as a service provider and a fully immersive experience. Even though the Fifth Generation Mobile Networks Standard communication environment going to be launched very soon will provide major improvements over the prevailing systems, they may not be able to satisfy the demands of future emerging wise and automation structures after 10 years. Hence, with Fifth Generation Mobile Networks Standard accomplishing its limits in 2030. To overcome the limitations of Fifth Generation Mobile Networks Standard for supporting new demanding situations, a sixth-generation wireless gadget will need to be evolved with new attractive capabilities. Now Sixth Generation Mobile Networks Standard is a Coming up Technology. It is the latest upcoming cellular brand bond technology standard. This is going to replace 5G incoming of the years.

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